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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/026,117 | 12/21/2001 | Ping-Chuan Wang | FIS9-2001-0311US1 | 4950 |
| 32074 | 7590 | 03/25/2003 | | |
| INTERNATIONAL BUSINESS MACHINES CORPORATION DEPT. 18G BLDG. 300-482 2070 ROUTE 52 HOPEWELL JUNCTION, NY 12533 | | | EXAMINER | SOWARD, IDA M |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2822 | |
| DATE MAILED: 03/25/2003 | | | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|--|--------------------------|--|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/026,117 | WANG ET AL. |
| | Examiner Ida M Soward | Art Unit 2822 |
| -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address -- | | |
| Period for Reply | | |
| A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION. | | |
| <ul style="list-style-type: none"> - Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication. - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely. - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication. - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). - Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b). | | |
| Status | | |
| <p>1)<input checked="" type="checkbox"/> Responsive to communication(s) filed on <u>06 January 2003</u>.</p> <p>2a)<input checked="" type="checkbox"/> This action is FINAL. 2b)<input type="checkbox"/> This action is non-final.</p> <p>3)<input type="checkbox"/> Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under <i>Ex parte Quayle</i>, 1935 C.D. 11, 453 O.G. 213.</p> | | |
| Disposition of Claims | | |
| <p>4)<input checked="" type="checkbox"/> Claim(s) <u>1-18</u> is/are pending in the application.</p> <p>4a) Of the above claim(s) _____ is/are withdrawn from consideration.</p> <p>5)<input type="checkbox"/> Claim(s) _____ is/are allowed.</p> <p>6)<input checked="" type="checkbox"/> Claim(s) <u>1-18</u> is/are rejected.</p> <p>7)<input type="checkbox"/> Claim(s) _____ is/are objected to.</p> <p>8)<input type="checkbox"/> Claim(s) _____ are subject to restriction and/or election requirement.</p> | | |
| Application Papers | | |
| <p>9)<input type="checkbox"/> The specification is objected to by the Examiner.</p> <p>10)<input type="checkbox"/> The drawing(s) filed on _____ is/are: a)<input type="checkbox"/> accepted or b)<input type="checkbox"/> objected to by the Examiner.</p> <p style="margin-left: 20px;">Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).</p> <p>11)<input type="checkbox"/> The proposed drawing correction filed on _____ is: a)<input type="checkbox"/> approved b)<input type="checkbox"/> disapproved by the Examiner.</p> <p style="margin-left: 20px;">If approved, corrected drawings are required in reply to this Office action.</p> <p>12)<input type="checkbox"/> The oath or declaration is objected to by the Examiner.</p> | | |
| Priority under 35 U.S.C. §§ 119 and 120 | | |
| <p>13)<input type="checkbox"/> Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).</p> <p>a)<input type="checkbox"/> All b)<input type="checkbox"/> Some * c)<input type="checkbox"/> None of:</p> <ol style="list-style-type: none"> 1.<input type="checkbox"/> Certified copies of the priority documents have been received. 2.<input type="checkbox"/> Certified copies of the priority documents have been received in Application No. _____. 3.<input type="checkbox"/> Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)). <p>* See the attached detailed Office action for a list of the certified copies not received.</p> <p>14)<input type="checkbox"/> Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).</p> <p style="margin-left: 20px;">a)<input type="checkbox"/> The translation of the foreign language provisional application has been received.</p> <p>15)<input type="checkbox"/> Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.</p> | | |
| Attachment(s) | | |
| <p>1)<input type="checkbox"/> Notice of References Cited (PTO-892)</p> <p>2)<input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</p> <p>3)<input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____</p> | | <p>4)<input type="checkbox"/> Interview Summary (PTO-413) Paper No(s) _____</p> <p>5)<input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</p> <p>6)<input type="checkbox"/> Other: _____</p> |

DETAILED ACTION

This Office Action is in response to the Applicants' amendment filed January 6, 2003.

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Objections

The objection to claim 1 has been withdrawn due to the amendment filed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-5, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saran (US 6,232,662 B1) in view of Cave et al. (US 6,313,024 B1).

Saran teaches a reinforced semiconductor interconnect structure, comprising: a first metal interconnect disposed in a first material **43a**, the first metal interconnect having a line portion **308** and at least one via portion **42**, an anode section **44** and a cathode section **43**, the via portion of the first metal interconnect located in the anode section, the line portion of the first metal interconnect having a top, bottom and terminus side, wherein at least part of the bottom side of the line portion of the first metal interconnect in contact with the first dielectric **309**; a first reinforcement **41** disposed in the first material, the first reinforcement in contact with at least the bottom side of the first metal interconnect, the first reinforcement comprising a second material, the second material being electrically conductive; and wherein the second material has a greater mechanical rigidity than the first material (Figures 3-4, cols. 8-9, lines 26-67 and 1-41) and a reinforcement **31b** being at most 50% of the length of the metal interconnect **31** (Figure 3). However, Saran fails to teach a first reinforcement being electrically nonconductive. Cave et al. teach a first reinforcement **24** being electrically nonconductive (Figure 8, cols. 7-8, lines 19-67 and 1-43). Cave et al. further teach a low dielectric constant of 3.6 which is in the range of at most about 4.3 (col. 2, lines 28-35). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the reinforced semiconductor interconnect

structure of Saran with the electrically nonconductive reinforcement of Cave et al. to improve device yield.

Claims 3, 6-10, 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saran (US 6,232,662 B1) and Cave et al. (US 6,313,024 B1) as applied to claim 1 above, and further in view of Wong (US 2002/0132468 A1).

Saran and Cave et al. teach all mentioned in the rejection above. Saran further teaches second **31** and third **32** metal interconnects, each disposed in a mechanically compliant dielectric, having a line portion (having a top and bottom), a via portion, an anode section, a cathode section, first & second reinforcements **41** (Figures 3-4) and a reinforcement **32b** being at most 50% of the length of the metal interconnect **32** (Figure 3). Cave et al. further teach a first **24**, second **32**, third **36**, fourth **44** and fifth **48** material being substantially the same such as parylene, silicon oxide or the like (Figure 7, col. 5, lines 44-64). However, Saran and Cave et al. fail to teach via portions of metal interconnect in electrical communication with the line portions of other metal interconnections. Wong teaches via portions of metal interconnect **106** in electrical communication with the line portion **204** of another metal interconnection **206** (Figure 10, page 4, paragraph [0047]). Wong further teach a first reinforcement in contact with via portion in an anode section of the second metal interconnect **206** and the top of the line portion **104** of the first interconnect **106**, wherein the first reinforcement being positioned in the dielectric **110** between the first and second interconnects (Figure 10) and a high dielectric constant (page 2, paragraph [0029]). Therefore, it would have

been obvious to one having ordinary skill in the art at the time the invention was made to modify the reinforced semiconductor interconnect structure of Saran and the electrically nonconductive reinforcement of Cave et al. with the electrical communication of Wong to reduce power dissipation.

Response to Arguments

Applicant's arguments filed 01-06-2003 have been fully considered but they are not persuasive.

In response to the remarks concerning none of the cited art discloses, teaches or claims solutions to electromigration voiding, the cited art teaches what is in the claims.

In response to the amendment of claim 1, Saran discloses a first reinforcement 41 in contact with the anode section 44 of the bottom side of a metal interconnect (inside via 42) in Figure 4.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M Soward whose telephone number is 703-305-3308. The examiner can normally be reached on Monday - Thursday, 6:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ims
March 23, 2003



AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800